

Fig. 1

UVTech Systems Inc., PhotoChemical Ablation Model

Case Definition

Removed Material	AZ 2400 Photo Resist
Reactive Gases	Ozone + Oxygen
Laser Wavelength (nm)	193
	266
Pulse Fluence	
Base Fluence Value (mJ/cm2)	1
Fluence Increment (mJ/cm2)	30

Gas Parameters

Reactive Gases	Starting Partial Pressure (Torr)	Partial Pressure Increment (Torr)	Molecular Cross Section (x 10 ⁻²⁰ cm)
Gas 1 (Ozone)	1	0	67.50
	1	0	810.00
	1	0	762.75
	1	0	0.07
Gas 2 (Oxygen)	499	0	0.00675
	499	0	0.0000675
	499	0	0
	499	0	0
other	0	0	0
	0	0	0
	0	0	0
	0	0	0
Total Pressure	500		
Optical Path Through Gas (cm)	3		

Material Parameters

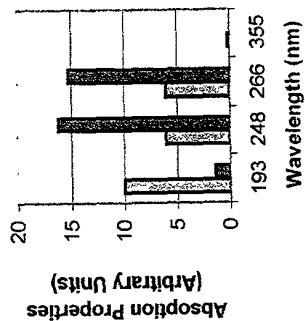
Material Absorption Coefficient (micron ⁻¹)	10
	1.73
	1.73
	0.148
Material Threshold (mJ/cm2)	5.19
	30
	30
	350.68
Material Refractive Index	2.10
	1.90
	1.86
	1.74
Angle of Incidence (Degrees)	0.1
Reflectivity Amplitude (s & p)	-0.31
	-0.30
	-0.27
Reflectivity Component (s & p)	0.13
	0.10
	0.09
	0.07
Total Reflectivity	0.13
	0.10
	0.09
	0.07

Chemical

Photo-chemical parameter 1	0.002
Photo-chemical parameter 2	0.02

Spectral Dependencies

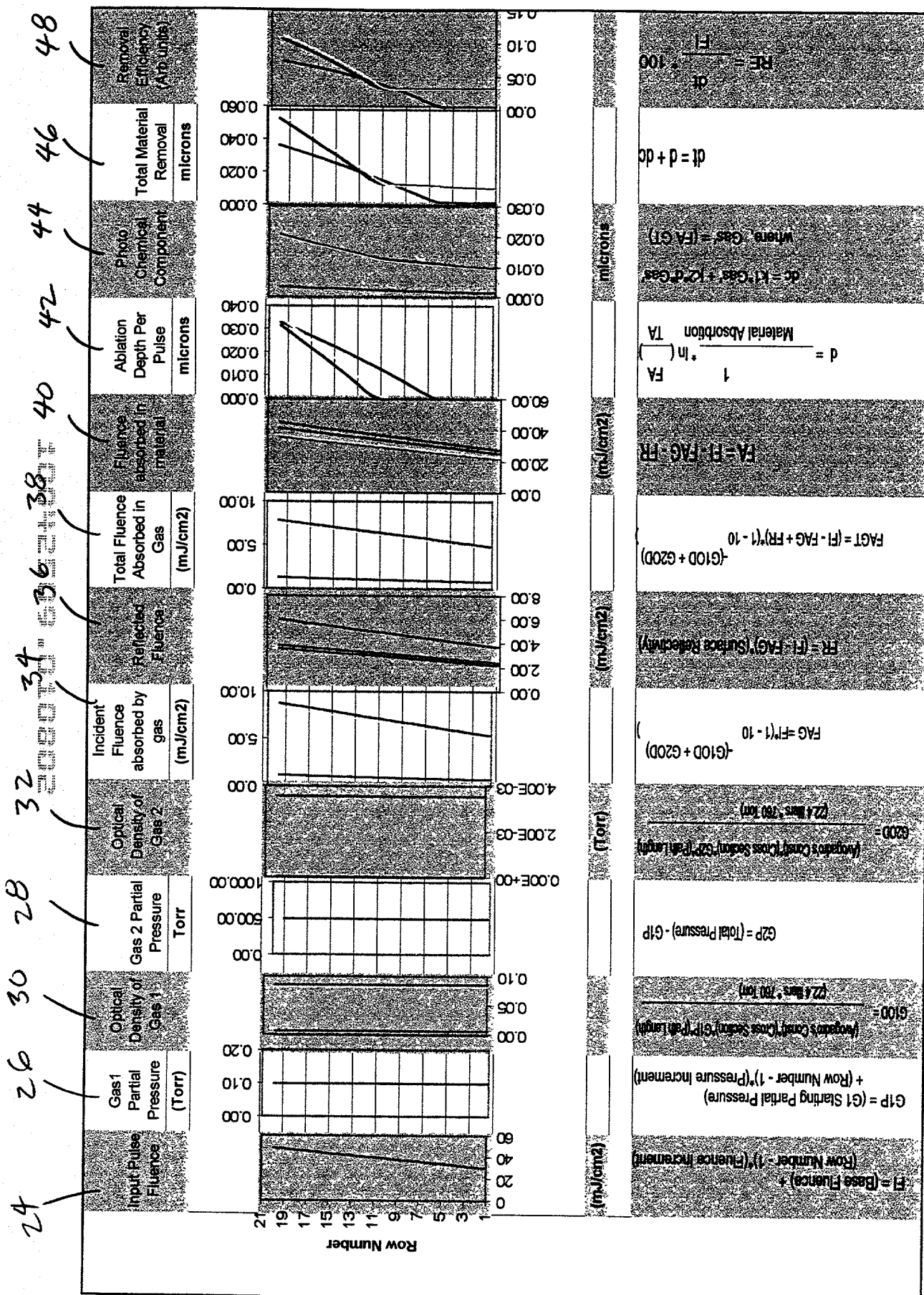
☐ Material Absorption
☒ Gas Absorption



1-1 67.2

62

60



$$FI = (Gas\ Fluence) + (Row\ Number - 1) * (Fluence\ Increment)$$

$$G1P = (G1\ Starting\ Partial\ Pressure) + (Row\ Number - 1) * (Pressure\ Increment)$$

$$G100 = \frac{(Acceptor's\ Cond\ Cross\ Section) * G1P * Path\ Length}{(22.4\ Bars * 760\ Torr)}$$

$$G2P = (Total\ Pressure) - G1P$$

$$G200 = \frac{(Acceptor's\ Cond\ Cross\ Section) * G2P * Path\ Length}{(22.4\ Bars * 760\ Torr)}$$

$$FAG = F * (1 - 10^{-(G100 + G200)})$$

$$FR = (FI - FAG) * (Surface\ Reflectivity)$$

$$FAGT = (FI - FAG + FR) * (1 - 10^{-(G100 + G200)})$$

$$FA = FI - FAG - FR$$

$$d = \frac{1}{FA * \ln\left(\frac{Material\ Absorption}{TA}\right)}$$

$$dc = k1 * Gas + k2 * d * Gas$$

where Gas = (FAG/GI)

$$dt = d + dc$$

$$RE = \frac{FI}{dt} * 100$$

193 nm									
Row Number	(mJ/cm ²)	(Torr)	Gas 1 Partial Pressure	(Torr)	Gas 2 Partial Pressure	(mJ/cm ²)	Incident Fluence absorbed by gas	(mJ/cm ²)	Total Fluence Absorbed in Gas
20	0.07	1.00	499.00	499.00	90.78	85.99	0.439	1.367	Total Material Removal
19	0.07	1.00	499.00	499.00	86.01	81.47	0.434	1.304	microns
18	0.07	1.00	499.00	499.00	81.24	76.95	0.428	1.241	
17	0.07	1.00	499.00	499.00	76.47	72.44	0.422	1.178	
16	0.07	1.00	499.00	499.00	71.70	67.92	0.416	1.116	
15	0.07	1.00	499.00	499.00	66.93	63.40	0.409	1.054	
14	0.07	1.00	499.00	499.00	62.16	58.88	0.401	0.992	
13	0.07	1.00	499.00	499.00	57.39	54.36	0.393	0.930	
12	0.07	1.00	499.00	499.00	52.62	49.85	0.385	0.868	
11	0.07	1.00	499.00	499.00	47.85	45.33	0.375	0.806	
10	0.07	1.00	499.00	499.00	43.08	40.81	0.365	0.744	
9	0.07	1.00	499.00	499.00	38.31	36.29	0.353	0.682	
8	0.07	1.00	499.00	499.00	33.55	31.78	0.340	0.619	
7	0.07	1.00	499.00	499.00	28.78	27.26	0.324	0.556	
6	0.07	1.00	499.00	499.00	24.01	22.74	0.306	0.491	
5	0.07	1.00	499.00	499.00	19.24	18.22	0.284	0.424	
4	0.07	1.00	499.00	499.00	14.47	13.70	0.256	0.353	
3	0.07	1.00	499.00	499.00	9.70	9.19	0.216	0.274	
2	0.07	1.00	499.00	499.00	4.93	4.67	0.148	0.171	
1	0.07	1.00	499.00	499.00	0.16	0.15	0.000	0.000	

Fig. 4